A DESCRIPTION OF THE JUVENILE LIFE-STAGES OF THE ANTARCTIC MITE *EREYNETES MACQUARIENSIS*

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Abstract. The juvenile life-stages of *Ereynetes macquariensis* Fain, a commonly occurring Antarctic and sub-Antarctic prostigmatid mite, are described with particular reference to the leg chaetotaxy and the structure of the genital field. The larval and protonymphal stages are described for the first time, and corrections are made to previous descriptions. The protonymph is recognized by the lack of setae on all the segments of leg IV except for the tarsus and by the simple structure of the genital field. Deutonymphs and tritonymphs are readily distinguishable, having three and eight pairs of setae in the genital area respectively.

Introduction

Ereynetes macquariensis was first described by Fain (1962) from adult and tritonymph material from Macquarie Island (54° 30′ S, 158° 57′ E). The species was redescribed from Signy Island, South Orkney Islands (60° 43′ S, 45° 36′ W), and Deception Island, South Shetland Islands (62° 57′ S, 60° 38′ W) by Strandtmann and Tilbrook (1968), and from South Georgia (54° S, 36° W) by Strandtmann (1970). In addition, the species has been reported by Fain (1976) from Îles Kerguelen (49° S, 69° E) and by Crooker (1977) from the Antarctic Peninsula.

Goddard (1979) studied the population biology of *E. macquariensis* in a moss-turf community on Signy Island, and he described the life-stages and provided notes on the general biology of the species (Goddard, 1980). During subsequent work at the same site between 1980 and 1982, it became apparent that only two of the three nymphal stages could be recognized from Goddard's work, and that the true identity of the protonymphs had not been recognized by Goddard (1980). This paper describes and illustrates all four juvenile stages: larva, protonymph, deutonymph and tritonymph.

Techniques

Specimens of *E. macquariensis* were recovered from cores of *Polytrichum alpestre* Hoppe and *Chorisodontium aciphyllum* (Hook. f. et Wils.) Broth. using high gradient extraction, and were fixed in 70% ethanol. Specimens were cleared in 30% lactic acid for routine determination and permanent slide preparations were made using Heinze-PVA mountant (Evans and others, 1981).

All specimens were examined under phase contrast microscopy and a magnification of ×400 was sufficient to determine chaetotaxy and genital structures. Some material of each life stage was studied with a ×100 oil immersion objective to examine the pedipalps and the small setae around the apices of the tarsi. Approximately 2000 specimens of *E. macquariensis* have been examined in temporary lactic acid mounts and 26 permanent preparations were made to study all the characters critically. Material is deposited in the British Museum (Natural History) (accession nos. 1983.3.21.1–20) and at the British Antarctic Survey, Cambridge. Setal nomenclature follows that of Strandtmann (1967).

Morphology and Chaetotaxy

Idiosoma: dorsal chaetotaxy constant in all life stages. *Propodosoma:* three pairs setae, one pair trichobothria, setae *iv* situated between, or slightly posterior to, setae

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ev, dehiscence line procurved (see André, 1981). *Hysterosoma:* eight pairs setae in five rows, but *el* position occupied by trichobothria; four pairs lyrifissures present in all stages, *ia, im,* and *ip* situated between first four rows of hysterosomal setae (André, 1981), posterior pair, *ih*, between anal setae in the larva, but between anal and sacral setae in older life stages (Fig. 1). Two pairs anal (pseudanal) setae in all life stages.

Pedipalps: structure constant, and chaetotaxy probably so. Pedipalp femur with two setae, the mid-dorsal seta especially, very strongly barbed, appearing rather spikey or multi-tined (Fig. 2). Pedipalp genu with two setae. Pedipalp tibia with three apical setae, two being eupathidial setae with relatively large, clearly visible, insertion points, the third much smaller with fine insertion point (unclear in smaller life stages). Pedipalp tarsus supporting (i) basally inserted, strong eupathidial seta, bifurcate at last from the deutonymph (bifurcation only seen in certain orientations, otherwise seta appearing broadly flattened or spoon shaped); and (ii) apically inserted claw-like structure, nude in distal half, finely barbed or feathered in proximal half.

Solenidiotaxy: constant throughout development, mid-dorsal solenidion in apical half of tarsi I and II, short solenidion within depression at base of pedipalp tibia. Ereynetal organ of tibia I always present.

Larva: hexapod, dorsal chaetotaxy as other life stages; ventrally, outer pair of rostral setae absent. Leg chaetotaxy as in (Table I). Anal region (Fig. 1a), with two pairs anal (pseudanal) setae, genital field undefined. Claparède's organ absent.

Protonymph: two pairs rostral setae. Chaetotaxy legs I–III similar to larva, but with addition of setae on coxa III and trochanter III; leg IV setae restricted to tarsus. Genital field (Fig. 1b) simple, with four small pores, but lacking setae.

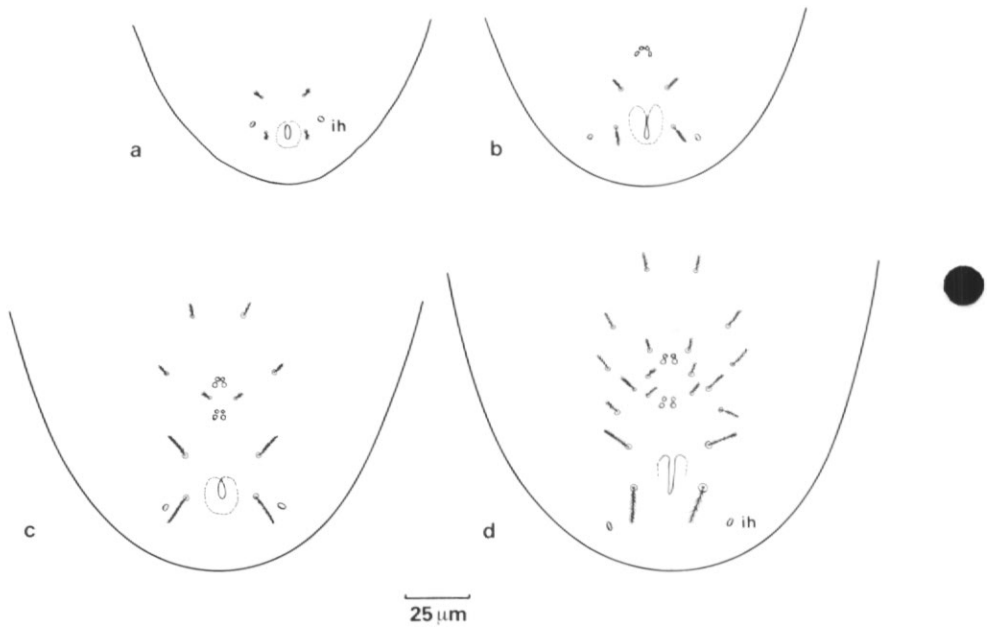

Fig. 1. *Ereynetes macquariensis* Fain; ano-genital region of larva and nymphs. a. larva; b. protonymph; c. deutonymph; d. tritonymph. ih, lyrifissure.

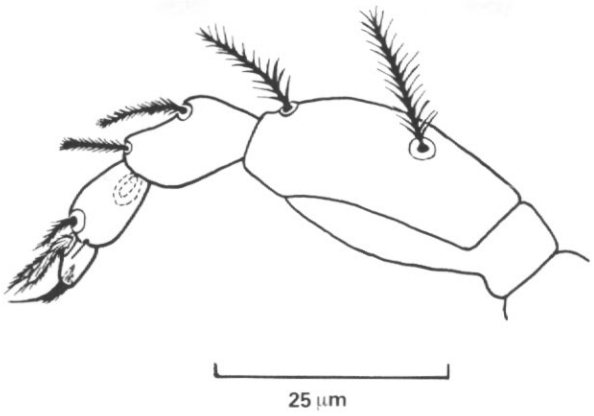

Fig. 2. *Ereynetes macquariensis* Fain; structure of pedipalp (in dorso-lateral view).

Table I. Leg chaetotaxy for all life stages of *Ereynetes macquariensis* Fain. The five values for each segment refer to larva, proto-, deuto-, tritonymph and adult respectively. Solenidia are omitted from the table.

Leg number	*I*	*II*	*III*	*IV*
Tarsus	10-10-10-12-12	6-6-6-8-9	5-5-7-7-8	-5-7-7-8
Tibia	5-5-5-6-6	2-2-2-3-3	2-2-2-3-3	-0-2-3-3
Genu	4-4-4-4-4	4-4-4-4-4	3-3-3-3-3	-0-3-3-3
Femur[1]	6-6-6-7-7	4-4-4-4-4	3-3-3-3-3	-0-3-4-4
Trochanter	0-0-1-1-1	0-0-1*-1*-1*	0-1-1-1-1	-0-0-0-0
Coxa[2]	3-3-3-3-3	1-1-1-1-1	2-3-4-4-4	-0-2-3-3

1. Femur IV is partially divided in tritonymph and adult stages.
2. Includes setae on the underside of the body between coxae III and IV.

* Nude seta.

Deutonymph: leg chaetotaxy (see Table I) with additional setae on trochanters I–II, coxa III, tarsi III–IV. Leg IV with setae. Genital field (Fig. 1c) with two sets of four small pores, one pair external genital setae, two pairs paragenital setae.

Tritonymph: leg chaetotaxy differs from adult only by lacking one seta on each of tarsi II–IV. Genital field (Fig. 1d) with two sets of four small pores, four pairs external genital setae, four pairs paragenital setae.

Discussion

Size ranges for the different life stages have not been quoted, since measurements were not made on live or alcohol-preserved material. Material for permanent mounting was selected from specimens in lactic acid which were fully distended and with appendages extended to facilitate observation. Thus these specimens, especially the larvae and protonymphs, were exaggerated in size and their measurements would have given a biased size range. Size ranges of the adults have been published with the original description and in subsequent redescriptions. Goddard (1980) has recorded size ranges for the juvenile stages that he recognized.

No variation in dorsal chaetotaxy was observed, and only two cases of variation in the genital field were observed. Both these cases involved asymmetry. One deutonymph had a posterior paragenital seta repositioned next to the adjacent

external genital seta, and a tritonymph had an additional external genital seta on one side only.

No variation in the leg chaetotaxy of cleared juvenile specimens, within stages, was observed but in one adult female specimen, the dorsal seta of genu IV was missing from only one leg. Since no insertion point was visible, the absence could not be accounted for by damage. However in another Antarctic mite, *Stereotydeus mollis* Womersley and Strandtmann, Pittard (1971) found considerable variation in the setation of the femora of legs I to III in tritonymphs and adults.

The setation of the genua (protonymph leg IV excepted), femora II and III, trochanter IV (larva excepted) and coxae I and II remained constant throughout development. The addition of setae on the tarsi occurred at three moults. A pair of dorsal setae were added to tarsi III and IV at the moult from protonymph to deutonymph. Between deutonymph and tritonymph, a pair of apico-ventral setae were added on tarsus I and a mid-dorsal pair were added on tarsus II. A single ventral seta was added on each of tarsi II to IV at the moult from tritonymph to adult. These sequences of addition are shown diagrammatically in Fig. 3. Pittard (1971) observed for *Stereotydeus mollis* that addition of setae during development concerned mainly the mid and posterior ventral positions, whilst the apical setation of the femora, genua, tibiae and tarsi of legs I to III remained unchanged. In *E. macquariensis*, many setae become thicker and heavier during development, so that in adults all the tarsal setae are eupathidial. Some setae are eupathidial throughout development, whilst others are added as slender, solid setae and become eupathidial at a subsequent moult.

The interpretation of the genital setation in the nymphs has varied between different authors. Since setae were absent from the opisthosoma, between the anal region and the mid-ventral coxal setae in both larvae and protonymphs, those setae appearing in this region during subsequent development have been considered to be of genital origin in this study. In the deutonymphs there are three pairs of setae, one pair of external genital setae, and two pairs of paragenital setae. Goddard (1980), in his interpretation of the protonymph, only considered one of the two pairs of paragenital setae.

Both Fain (1962) and Strandtmann and Tilbrook (1968) examined tritonymph as well as adult material. Strandtmann and Tilbrook (1968) only considered there to be four to five pairs of setae in the genital area of tritonymphs, whilst Goddard (1980) described the tritonymphs as possessing three pairs of both external genital setae and paragenital setae. Fain (1962) described the tritonymphs as having '8 small bare disks surrounded by 8 pairs of barbeled setae' and Fig. 1d supports this finding. The eight pairs of setae fell into two groups, comprising four pairs of both external genital setae and paragenital setae. Three of the four pairs of external genital setae were in line, and adjacent to the genital pores, whilst the fourth pair were laterally displaced (Fig. 1d). An homologous situation was found in the adults, most readily observed in the females, where five of the six pairs of external genital setae were in line, and one pair was displaced laterally. The four pairs of paragenital setae in the tritonymphs were in positions similar to those in the adults. Strandtmann and Tilbrook (1968), in their fig. 3a, and Goddard (1980), in his figs. 5a and 5b, recorded five pairs of paragenital setae for the adults but the posterior or fifth pair of setae in their illustrations appears to refer to the anterior of the two pairs of anal setae. Only four pairs of paragenital setae in the adults were counted during the present study, although it is possible that some variation between different populations accounts for these differences.

The pedipalps are small and the smaller setae were difficult to see. The general features depicted in Fig. 2 are similar to those observed by Fain (1962) and

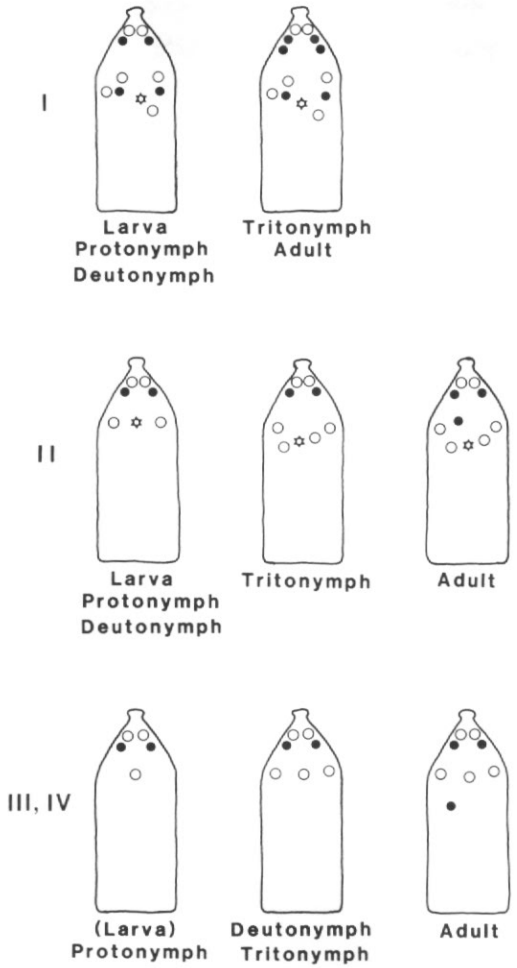

Fig. 3. *Ereynetes macquariensis* Fain; arrangement of setae on tarsi I–IV (shown diagrammatically) for all life stages (leg IV absent in larva). Open circles, dorsal setae; closed circles, ventral setae; star, solenidion.

Strandtmann and Tilbrook (1968). The two large apical setae on the pedipalp tibia were readily observed in all life stages, but the third seta, which was fine and possibly nude, was unclear in the smaller life stages, particularly the larva and protonymph.

The protonymph of *E. macquariensis* is short lived, which must account for why Goddard (1979, 1980), sampling monthly, missed it. As a result, he interpreted the deutonymph as being the protonymph, shown clearly by his fig. 5c and in his table of leg chaetotaxy. Perhaps he considered *Ereynetes* nymphs to be analogous to the nymphs of *Eupodes* and *Stereotydeus*, where proto, deuto and tritonymphs have one, two and three pairs of genital setae respectively. Goddard's slide-mounted material at the British Antarctic Survey headquarters, Cambridge, and at the station on Signy Island was examined. All specimens labelled 'protonymph' had one pair of external genital setae and thus were deutonymphs. Only two slides labelled as containing deutonymphs, were located: one contained a deutonymph with one pair

of external genital setae, and the other contained a laterally mounted, damaged tritonymph. It is probable that Goddard's (1980) fig. 5d was based on a misinterpretation of this damaged tritonymph, although he recorded a deutonymph size range based on measurements of six specimens.

The Signy Island specimens of *E. macquariensis* agree with the original description in all aspects of chaetotaxy, allowing for some differences in interpretation of the coxal setae and the laterally displaced, external genital setae of the adult females. Fain (1962) placed *macquariensis* in the genus *Ereynetes*, but considered the weakness of the dorsal shield and the simplification of the dorsal chaetotaxy to approach the characters of the genus *Riccardoella*. Specimens of *E. macquariensis* from Îles Kerguelen and Marion Island, examined by Fain (1976), also agreed well with the type series, except that in general they were rather less well sclerotized. A sclerotized dorsal shield could not be found in the Signy Island specimens, nor in specimens from the Antarctic Peninsula. There seems to be no need to consider any subspecific or varietal names for these non-sclerotized specimens unless other differentiating characters are discovered.

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